

## SEQUENCE LISTING

<110> Tuomanen, Elaine I  
Wizemann, Theresa M.  
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Johnson, Leslie S.  
Koenig, Scott

<120> POLYPEPTIDE COMPRISING THE AMINO ACID OF AN N-TERMINAL  
CHOLINE BINDING PROTEIN A TRUNCATE, VACCINE DERIVED  
THEREFROM AND USES THEREOF

<130> 5853-2

<140> 09/056,019

<141> 1998-04-07

<160> 40.

&lt;170&gt; PatentIn Ver. 2.0

<210> 1

<211> 406

<212> PRT

<213> Streptococcus pneumoniae

<400> 1

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Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu  
20 25 30

Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val  
35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val  
50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys  
65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu  
85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser  
100 105 110

Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp  
115 120 125

Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu  
130 135 140

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys  
145 150 155 160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu  
 165 170 175  
 Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu  
 180 185 190  
 Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys  
 195 200 205  
 Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu  
 210 215 220  
 Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg  
 225 230 235 240  
 Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg  
 245 250 255  
 Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
 260 265 270  
 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser  
 275 280 285  
 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu  
 290 295 300  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 305 310 315 320  
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
 325 330 335  
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 340 345 350  
 Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu  
 355 360 365  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg  
 370 375 380  
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys  
 385 390 395 400  
 Val Lys Glu Lys Pro Ala  
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 <211> 655  
 <212> PRT  
 <213> Streptococcus pneumoniae

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 Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val  
 35 40 45  
 Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val  
 50 55 60  
 Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys  
 65 70 75 80  
 Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu  
 85 90 95  
 Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser  
 100 105 110  
 Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp  
 115 120 125  
 Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu  
 130 135 140  
 Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys  
 145 150 155 160  
 Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu  
 165 170 175  
 Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu  
 180 185 190  
 Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys  
 195 200 205  
 Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu  
 210 215 220  
 Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg  
 225 230 235 240  
 Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg  
 245 250 255  
 Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
 260 265 270  
 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser  
 275 280 285  
 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu  
 290 295 300  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 305 310 315 320

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
 325 330 335  
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 340 345 350  
 Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu  
 355 360 365  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg  
 370 375 380  
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys  
 385 390 395 400  
 Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys  
 405 410 415  
 Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln  
 420 425 430  
 Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu Asp Tyr Ala  
 435 440 445  
 Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro  
 450 455 460  
 Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr Gly Trp Lys  
 465 470 475 480  
 Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala  
 485 490 495  
 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn  
 500 505 510  
 Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr  
 515 520 525  
 Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly  
 530 535 540  
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu  
 545 550 555 560  
 Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala  
 565 570 575  
 Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
 580 585 590  
 Gly Asp Met Ala Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr  
 595 600 605  
 Leu Glu Ala Ser Gly Ala Met Lys Ala Ser Gln Trp Phe Lys Val Ser  
 610 615 620

Asp Lys Trp Tyr Tyr Val Asn Gly Ser Gly Ala Leu Ala Val Asn Thr  
 625 630 635 640

Thr Val Asp Gly Tyr Gly Val Asn Ala Asn Gly Glu Trp Val Asn  
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<210> 3

<211> 284

<212> PRT

<213> Streptococcus pneumoniae

<400> 3

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 20 25 30

Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val  
 35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val  
 50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys  
 65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu  
 85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser  
 100 105 110

Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp  
 115 120 125

Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu  
 130 135 140

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys  
 145 150 155 160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu  
 165 170 175

Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu  
 180 185 190

Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys  
 195 200 205

Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu  
 210 215 220

Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg

225                      230                      235                      240  
 Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg  
                                  245                      250                      255  
 Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
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 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu  
                                  275                      280

<210> 4  
 <211> 106  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 4  
 Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
   1                                 5                                 10                                 15  
 Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
                                  20                                 25                                 30  
 Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val  
                                  35                                 40                                 45  
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
   50                                 55                                 60  
 Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser  
   65                                 70                                 75                                 80  
 Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys  
                                  85                                 90                                 95  
 Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala  
                                  100                                 105

<210> 5  
 <211> 109  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 5  
 Thr Glu Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
   1                                 5                                 10                                 15  
 Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
                                  20                                 25                                 30  
 Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
                                  35                                 40                                 45  
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn  
   50                                 55                                 60

Glu Pro Arg Asp Glu Gln Lys Ile Lys Gln Ala Glu Ala Glu Val Glu  
65 70 75 80

Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg  
85 90 95

Glu Glu Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala  
100 105

<210> 6

<211> 4

<212> PRT

<213> Streptococcus pneumoniae

<220>

<221> NON\_CONS

<222> (2)..(3)

<223> They could be any amino acid at these two  
locations.

<400> 6

Lys Xaa Xaa Glu  
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<210> 7

<211> 376

<212> PRT

<213> Streptococcus pneumoniae

<400> 7

Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
1 5 10 15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu  
20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp  
 130 135 140  
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 145 150 155 160  
 Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu  
 165 170 175  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
 180 185 190  
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys  
 195 200 205  
 Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala  
 210 215 220  
 Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn  
 225 230 235 240  
 Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser  
 245 250 255  
 Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val  
 260 265 270  
 Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg  
 275 280 285  
 Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu  
 290 295 300  
 Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu  
 305 310 315 320  
 Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys  
 325 330 335  
 Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr  
 340 345 350  
 Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu  
 355 360 365  
 Asp Lys Val Lys Glu Lys Pro Ala  
 370 375

<210> 8  
 <211> 663  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 8  
 Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
 1 5 10 15



RTA01/2129217v1

Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys  
 325 330 335  
 Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr  
 340 345 350  
 Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu  
 355 360 365  
 Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala  
 370 375 380  
 Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln  
 385 390 395 400  
 Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu Asp Tyr Ala  
 405 410 415  
 Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro  
 420 425 430  
 Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr Gly Trp Lys  
 435 440 445  
 Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala  
 450 455 460  
 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
 465 470 475 480  
 Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr  
 485 490 495  
 Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly  
 500 505 510  
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala Thr Gly Trp Leu  
 515 520 525  
 Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn Gly Ala Met Ala  
 530 535 540  
 Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
 545 550 555 560  
 Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr  
 565 570 575  
 Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly  
 580 585 590  
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Val  
 595 600 605  
 Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys  
 610 615 620

Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly  
625 630 635 640

Ser Gly Ala Leu Ala Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn  
645 650 655

Ala Asn Gly Glu Trp Val Asn  
660

<210> 9

<211> 254

<212> PRT

<213> Streptococcus pneumoniae

<400> 9

Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
1 5 10 15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu  
20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp  
130 135 140

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
145 150 155 160

Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu  
165 170 175

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
180 185 190

Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys  
195 200 205

Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala

210 215 220  
 Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn  
 225 230 235 240

Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu  
 245 250

<210> 10  
 <211> 106  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 10  
 Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
 1 5 10 15

Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
 20 25 30

Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu Ser Asp Val  
 35 40 45

Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
 50 55 60

Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser  
 65 70 75 80

Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys  
 85 90 95

Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala  
 100 105

<210> 11  
 <211> 107  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 11  
 Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu Ala Lys  
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Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr  
 20 25 30

Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys  
 35 40 45

Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser  
 50 55 60

Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys  
 65 70 75 80

Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys  
85 90 95

Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala  
100 105

<210> 12  
<211> 1219  
<212> DNA  
<213> Streptococcus pneumoniae

<400> 12  
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gaacaaggag aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagagggtc 120  
gaggaatatg taataaaaaat agtgggtgag agctatgcaa aatcaactaa aaagcgacat 180  
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaaa 240  
atagttgaat caacctcaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300  
gtagatgaag ctgtgtctaa gtttgaaaag gactcatctt cttcgtcaag ttcagactct 360  
tccactaaac cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420  
aaggtagcag aagctaagaa gaaggttgaa gaagctgaga aaaaagccaa ggatcaaaaa 480  
gaagaagatc gtcgtaacta cccaaccatt acttacaaaa cgcttgaact tgaaattgct 540  
gagtcggatg tggaagttaa aaaagcggag cttgaactag taaaagttaa agctaacgaa 600  
cctcgagacg agcaaaaaat taagcaagca gaagcgggag ttgagagtaa acaagctgag 660  
gctacaaggt taataaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720  
agagcagatg ctaaagagca aggtaaacca aaggggaggg caaacgagg agttcctgga 780  
gagctagcaa cacctgataa aaaagaaaat gatgcgaagt cttcagattc tagcgtagg 840  
gaagaaactc ttccaagccc atccctgaaa ccagaaaaaa aggtagcaga agctgagaag 900  
aaggttgaa aagctaagaa aaaagccgag gatcaaaaag aagaagatcg ccgtaactac 960  
ccaaccaata cttacaaaac gcttgaaactt gaaattgctg agtcggatgt ggaagttaaa 1020  
aaagcggagc ttgaactagt aaaagaggaa gctaaggaaac ctcgaaacga ggaaaaagtt 1080  
aagcaagcaa aagcgggaagt tgagagtaaa aaagctgagg ctacaagggtt agaaaaaatc 1140  
aagacagatc gtaaaaaagc agaagaagaa gctaaacgaa aagcagcaga agaagataaa 1200  
gttaaagaaa aaccagctg 1219

<210> 13  
<211> 1969  
<212> DNA  
<213> Streptococcus pneumoniae

<400> 13  
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gaacaaggag aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagagggtc 120  
gaggaatatg taataaaaaat agtgggtgag agctatgcaa aatcaactaa aaagcgacat 180  
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaaa 240  
atagttgaat caacctcaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300  
gtagatgaag ctgtgtctaa gtttgaaaag gactcatctt cttcgtcaag ttcagactct 360  
tccactaaac cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420  
aaggtagcag aagctaagaa gaaggttgaa gaagctgaga aaaaagccaa ggatcaaaaa 480  
gaagaagatc gtcgtaacta cccaaccatt acttacaaaa cgcttgaact tgaaattgct 540  
gagtcggatg tggaagttaa aaaagcggag cttgaactag taaaagttaa agctaacgaa 600  
cctcgagacg agcaaaaaat taagcaagca gaagcgggag ttgagagtaa acaagctgag 660  
gctacaaggt taataaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720  
agagcagatg ctaaagagca aggtaaacca aaggggaggg caaacgagg agttcctgga 780  
gagctagcaa cacctgataa aaaagaaaat gatgcgaagt cttcagattc tagcgtagg 840  
gaagaaactc ttccaagccc atccctgaaa ccagaaaaaa aggtagcaga agctgagaag 900

aaggttgaag	aagctaagaa	aaaagccgag	gatcaaaaag	aagaagatcg	ccgtaactac	960
ccaaccaata	cttacaaaac	gcttgaactt	gaaattgctg	agtccgatgt	ggaagttaaa	1020
aaagcggagg	cttgaactag	taaaagagga	agctaaggaa	cctcgaaacg	aggaaaaagt	1080
taagcaagca	aaagcggaag	ttgagagtaa	aaaagctgag	gctacaaggt	tagaaaaaat	1140
caagacagat	cgtaaaaaag	cagaagaaga	agctaaacga	aaagcagcag	aagaagataa	1200
agttaaagaa	aaaccagctg	aacaaccaca	accagcgccg	gctccaaaag	cagaaaaacc	1260
agctccagct	ccaaaaccag	agaatccagc	tgaacaacca	aaagcagaaa	aaccagctga	1320
tcaacaagct	gaagaagact	atgctcgtag	atcagaagaa	gaatataatc	gcttgactca	1380
acagcaaccg	ccaaaaactg	aaaaaccagc	acaaccatct	actccaaaaa	caggctggaa	1440
acaagaaaac	ggatatgtgt	acttctacaa	tactgatggg	tcaatggcga	caggatggct	1500
ccaaaacaat	ggctcatggg	actacctcaa	cagcaatggc	gctatggcga	caggatggct	1560
ccaaaacaat	ggttcatggg	actatctaaa	cgctaattgg	tcaatggcaa	caggatggct	1620
ccaaaacaat	ggttcatggg	actacctaaa	cgctaattgg	tcaatggcga	caggatggct	1680
ccaatacaat	ggctcatggg	actacctaaa	cgctaattgg	tcaatggcga	caggatggct	1740
ccaatacaat	ggctcatggg	actacctaaa	cgctaattgg	gatatggcga	cagggtgggt	1800
gaaagatgga	gatacctggg	actatcttga	agcatcaggt	gctatgaaag	caagccaatg	1860
gttcaaagta	tcagataaat	ggtactatgt	caatggctca	ggtgcccttg	cagtcaacac	1920
aactgtagat	ggctatggag	tcaatgccaa	tggtgaatgg	gtaaactaa		1969

<210> 14  
 <211> 853  
 <212> DNA  
 <213> Streptococcus pneumoniae

<400> 14		
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gaacaaggag	aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagaggtc 120	
gaggaatatg	taaaaaaaaa agtggttgag agctatgcaa aatcaactaa aaagcgacat 180	
acaattactg	tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaa 240	
atagttgaat	caacctcaga aagccaacta cagatactga tgatggagag tcatcaaaaa 300	
gtagatgaag	ctgtgtctaa gtttgaaaag gactcatctt cttcgtaag ttcagactct 360	
tccactaaac	cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420	
aaggtagcag	aagctaagaa gaagggttga gaagctgaga aaaaagccaa ggatcaaaaa 480	
gaagaagatc	gtcgtactaa cccaaccatt acttacaaaa cgcttgaact tgaaattgct 540	
gagtcggatg	tggaagttaa aaaagcggag cttgaactag taaaagttaa agctaacgaa 600	
cctcgagacg	agcaaaaaat taagcaagca gaagcggaag ttgagagtaa acaagctgag 660	
gctacaaggt	taaaaaaaaa caagacagat cgtgaagaag cagaagaaga agctaaacga 720	
agagcagatg	ctaaagagca aggtaaacca aaggggcggg caaaacgagg agttcctgga 780	
gagctagcaa	cacctgataa aaaagaaaat gatgcgaagt cttcagattc tagcgtaggt 840	
gaagaaactc	ttc	853

<210> 15  
 <211> 318  
 <212> DNA  
 <213> Streptococcus pneumoniae

<400> 15		
aaaccagaaa	aaaaggtagc agaagctgag aagaagggtg aagaagctaa gaaaaagcc 60	
gaggatcaaa	aagaagaaga tcgccgtaac tacccaacca atacttaca aacgcttgaa 120	
cttgaaattg	ctgagtcgga tgtggaagtt aaaaaagcgg agcttgaact agtaaaagag 180	
gaagctaagg	aacctcgaaa cgaggaaaaa gttaagcaag caaaagcggg agttgagagt 240	
aaaaaagctg	aggctacaag gttagaaaaa atcaagacag atcgtaaaaa agcagaagaa 300	
gaagctaaac	gaaaagca	318

<210> 16  
 <211> 327  
 <212> DNA

<213> Streptococcus pneumoniae

<400> 16

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acagaaccag gagaaaaggt agcagaagct aagaagaagg ttgaagaagc tgagaaaaaa 60
gccaaggatc aaaaagaaga agatcgctcg aactacccaa ccattactta caaacgctt 120
gaacttgaaa ttgctgagtc cgatgtggaa gttaaaaaag cggagcttga actagtaaaa 180
gtgaaagcta acgaacctcg agacgagcaa aaaattaagc aagcagaagc ggaagttgag 240
agtaaacaag ctgagggtac aaggttaaaa aaaatcaaga cagatcgtga agaagcagaa 300
gaagaagcta aacgaagagc agatgct 327
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<210> 17

<211> 1129

<212> DNA

<213> Streptococcus pneumoniae

<400> 17

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gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60
aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tgttgaggga gattcaacta 120
gatagaagaa aacataccca aaatgtcgcc ttaaacataa agttgagcgc aattaaaacg 180
aagtatttgc gtgaattaaa tgttttagaa gagaagtcga aagatgagtt gccgtcagaa 240
ataaaagcaa agttagacgc agcttttgag aagtttaaaa aagatacatt gaaaccagga 300
gaaaaggtag cagaagctaa gaagaagggt gaagaagcta agaaaaaagc cgaggatcaa 360
aaagaagaag atcgtcgtaa ctacccaacc aatacttaca aaacgcttga acttgaaatt 420
gctgagttcg atgtgaaagt taaagaagcg gagcttgaac tagtaaaaga ggaagctaaa 480
gaatctcgaa acgagggcac aattaagcaa gcaaaagaga aagttgagag taaaaaagct 540
gaggctacaa ggtagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600
cgaaaagcag atgctaagtt gaaggaagct aatgtagcga cttcagatca aggtaaacca 660
aaggggcggg caaacgagg agttcctgga gagctagcaa cacctgataa aaaagaaaat 720
gatgcgaagt cttcagattc tagcgtaggt gaagaaactc ttccaagctc atccctgaaa 780
tcaggaaaaa aggtagcaga agctgagaag aaggttgaag aagctgagaa aaaagccaag 840
gatcaaaaag aagaagatcg ccgtaactac ccaaccaata cttacaaaac gcttgacctt 900
gaaattgctg agtccgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 960
gctaaggaac ctcgagacga ggaaaaaatt aagcaagcaa aagcgaaagt tgagagtaaa 1020
aaagctgagg ctacaagggt agaaaacatc aagacagatc gtaaaaaagc agaagaagaa 1080
gctaaacgaa aagcagcaga agaagataaa gttaaagaaa aaccagctg 1129
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<210> 18

<211> 1992

<212> DNA

<213> Streptococcus pneumoniae

<400> 18

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gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60
aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tgttgaggga gattcaacta 120
gatagaagaa aacataccca aaatgtcgcc ttaaacataa agttgagcgc aattaaaacg 180
aagtatttgc gtgaattaaa tgttttagaa gagaagtcga aagatgagtt gccgtcagaa 240
ataaaagcaa agttagacgc agcttttgag aagtttaaaa aagatacatt gaaaccagga 300
gaaaaggtag cagaagctaa gaagaagggt gaagaagcta agaaaaaagc cgaggatcaa 360
aaagaagaag atcgtcgtaa ctacccaacc aatacttaca aaacgcttga acttgaaatt 420
gctgagttcg atgtgaaagt taaagaagcg gagcttgaac tagtaaaaga ggaagctaaa 480
gaatctcgaa acgagggcac aattaagcaa gcaaaagaga aagttgagag taaaaaagct 540
gaggctacaa ggtagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600
cgaaaagcag atgctaagtt gaaggaagct aatgtagcga cttcagatca aggtaaacca 660
aaggggcggg caaacgagg agttcctgga gagctagcaa cacctgataa aaaagaaaat 720
gatgcgaagt cttcagattc tagcgtaggt gaagaaactc ttccaagctc atccctgaaa 780
tcaggaaaaa aggtagcaga agctgagaag aaggttgaag aagctgagaa aaaagccaag 840
gatcaaaaag aagaagatcg ccgtaactac ccaaccaata cttacaaaac gcttgacctt 900
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<400> 21  
ccaggagaaa aggtagcaga agctaagaag aaggttgaag aagctaagaa aaaagccgag 60  
gatcaaaaag aagaagatcg tcgtaactac ccaaccaata cttacaaaac gcttgaactt 120  
gaaattgctg agttcgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 180  
gctaaagaat ctcgaaacga gggcacaatt aagcaagcaa aagagaaagt tgagagtaaa 240  
aaagctgagg ctacaagggt agaaaacatc aagacagatc gtaaaaaagc agaagaagaa 300  
gctaaacgaa aagcagatgc t 321

<210> 22  
<211> 121  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 22  
Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys  
1 5 10 15  
Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg  
20 25 30  
Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala  
35 40 45  
Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu  
50 55 60  
Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala  
65 70 75 80  
Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys  
85 90 95  
Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu  
100 105 110  
Glu Asp Lys Val Lys Glu Lys Pro Ala  
115 120

<210> 23  
<211> 122  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 23  
Pro Ser Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys  
1 5 10 15  
Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp  
20 25 30  
Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile  
35 40 45  
Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys  
50 55 60

Glu Glu Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys  
 65 70 75 80  
 Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile  
 85 90 95  
 Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala  
 100 105 110  
 Glu Glu Asp Lys Val Lys Glu Lys Arg Ala  
 115 120

<210> 24  
 <211> 428  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 24  
 Glu Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn  
 1 5 10 15  
 Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu  
 20 25 30  
 Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val  
 35 40 45  
 Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val  
 50 55 60  
 Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys  
 65 70 75 80  
 Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu  
 85 90 95  
 Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser  
 100 105 110  
 Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp  
 115 120 125  
 Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu  
 130 135 140  
 Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys  
 145 150 155 160  
 Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu  
 165 170 175  
 Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu  
 180 185 190  
 Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys

195	200	205
Gln Ala Glu Ala Glu Val	Glu Ser Lys Gln Ala	Glu Ala Thr Arg Leu
210	215	220
Lys Lys Ile Lys Thr Asp Arg	Glu Glu Ala Glu Glu Glu Ala	Lys Arg
225	230	235 240
Arg Ala Asp Ala Lys Glu Gln Gly Lys	Pro Lys Gly Arg Ala	Lys Arg
245	250	255
Gly Val Pro Gly Glu Leu Ala Thr	Pro Asp Lys Lys Glu Asn Asp Ala	
260	265	270
Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu	Pro Ser Pro Ser	
275	280	285
Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu		
290	295	300
Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr		
305	310	315 320
Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp		
325	330	335
Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys		
340	345	350
Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu		
355	360	365
Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg		
370	375	380
Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys		
385	390	395 400
Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys		
405	410	415
Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn		
420	425	

<210> 25  
 <211> 23  
 <212> DNA  
 <213> Streptococcus pneumoniae

<400> 25  
 ggcggatcca tggaraayga rgg

23

<210> 26  
 <211> 33  
 <212> DNA  
 <213> Streptococcus pneumoniae

<400> 26  
gccgtcgact tagtttaccc attcaccatt ggc

33

<210> 27  
<211> 5  
<212> PRT  
<213> Streptococcus pneumoniae

<220>  
<221> VARIANT  
<222> (1)  
<223> It could be any amino acid.

<400> 27  
Xaa Glu Asn Glu Gly  
1 5

<210> 28  
<211> 439  
<212> PRT  
<213> Streptococcus pneumoniae

<220>  
<221> VARIANT  
<222> (243)  
<223> It could be any amino acid.

<400> 28  
Ala Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys  
1 5 10 15  
Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Lys Ala Asn Lys Ser  
20 25 30  
Gln Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys  
35 40 45  
Lys Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu  
50 55 60  
Leu Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser  
65 70 75 80  
Val Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala  
85 90 95  
Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr  
100 105 110  
Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
115 120 125  
Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro  
130 135 140

Thr Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val  
 145 150 155 160  
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
 165 170 175  
 Ser Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn  
 180 185 190  
 Lys Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu  
 195 200 205  
 Lys Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala  
 210 215 220  
 Asn Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg  
 225 230 235 240  
 Glu Val Xaa Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
 245 250 255  
 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser  
 260 265 270  
 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu  
 275 280 285  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 290 295 300  
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
 305 310 315 320  
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 325 330 335  
 Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu  
 340 345 350  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
 355 360 365  
 Lys Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp  
 370 375 380  
 Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro  
 385 390 395 400  
 Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro  
 405 410 415  
 Ala Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro  
 420 425 430  
 Ala Asp Gln Gln Ala Glu Glu  
 435

<210> 29  
 <211> 437  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 29  
 Ala Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys  
   1                  5                  10                  15  
 Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Lys Ser  
                   20                  25                  30  
 Gln Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys  
           35                  40                  45  
 Lys Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu  
       50                  55                  60  
 Leu Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser  
   65                  70                  75                  80  
 Val Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala  
                   85                  90                  95  
 Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr  
           100                  105                  110  
 Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
       115                  120                  125  
 Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro  
       130                  135                  140  
 Thr Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val  
   145                  150                  155                  160  
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
           165                  170                  175  
 Ser Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn  
       180                  185                  190  
 Lys Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu  
       195                  200                  205  
 Lys Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala  
       210                  215                  220  
 Asn Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg  
   225                  230                  235                  240  
 Glu Val Leu Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
           245                  250                  255  
 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser  
       260                  265                  270

Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu  
 275 280 285  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 290 295 300  
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
 305 310 315 320  
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 325 330 335  
 Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu  
 340 345 350  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
 355 360 365  
 Lys Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp  
 370 375 380  
 Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro  
 385 390 395 400  
 Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro  
 405 410 415  
 Ala Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro  
 420 425 430  
 Ala Asp Gln Gln Ala  
 435

<210> 30  
 <211> 439  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 30  
 Val Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu  
 1 5 10 15  
 Lys Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Glu  
 20 25 30  
 Ser Gln Ala Gly His Arg Lys Ala Ala Glu Gln Phe Asp Glu Tyr Ile  
 35 40 45  
 Lys Thr Met Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Phe Ala  
 50 55 60  
 Leu Asn Ile Lys Leu Ser Arg Ile Lys Thr Glu Tyr Leu Arg Lys Leu  
 65 70 75 80  
 Asn Val Leu Glu Glu Lys Ser Lys Ala Glu Leu Pro Ser Glu Thr Lys





385		390		395		400
Ala Pro Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro						
	405		410		415	
Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr						
	420		425		430	
Asp Asp Gln Gln Ala Glu Glu						
	435					
<210> 31						
<211> 419						
<212> PRT						
<213> Streptococcus pneumoniae						
<400> 31						
Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu Asn						
1		5		10		15
Glu Gly Thr Thr Gln Ala Pro Thr Ser Ser Asn Arg Gly Asn Glu Ser						
	20		25		30	
Gln Ala Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Glu						
	35		40		45	
Lys Met Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu						
	50		55		60	
Leu Thr Lys Leu Gly Ala Ile Lys Thr Glu Tyr Leu Arg Gly Leu Ser						
	65		70		75	80
Val Ser Lys Glu Lys Ser Thr Ala Glu Leu Pro Ser Glu Ile Lys Glu						
		85		90		95
Lys Leu Thr Ala Ala Phe Lys Gln Phe Lys Lys Asp Thr Leu Lys Pro						
	100		105		110	
Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Ala Glu Ala Lys Lys						
	115		120		125	
Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile						
	130		135		140	
Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val						
	145		150		155	160
Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn Glu Pro Arg						
	165		170		175	
Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Lys						
	180		185		190	
Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Lys Ala						
	195		200		205	

Glu Glu Glu Ala Lys Arg Arg Val Asp Ala Lys Glu Gln Asp Glu Ser  
 210 215 220  
 Ser Lys Arg Arg Lys Ser Arg Val Lys Arg Gly Asp Val Gly Glu Gln  
 225 230 235 240  
 Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser  
 245 250 255  
 Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys Pro Gly Lys Lys  
 260 265 270  
 Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Asp Lys Lys Ala Lys  
 275 280 285  
 Ala Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys  
 290 295 300  
 Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala  
 305 310 315 320  
 Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro Arg Asn Glu Glu  
 325 330 335  
 Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala  
 340 345 350  
 Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu  
 355 360 365  
 Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala  
 370 375 380  
 Glu Gln Pro Lys Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro Ala Pro  
 385 390 395 400  
 Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp  
 405 410 415  
 Gln Gln Ala

<210> 32  
 <211> 437  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 32  
 Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys Glu  
 1 5 10 15  
 Val Thr Thr Gln Val Ala Thr Ser Ser Asn Lys Ala Asn Lys Ser Gln  
 20 25 30  
 Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys Lys  
 35 40 45

Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu Leu  
 50 55 60  
 Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser Val  
 65 70 75 80  
 Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala Lys  
 85 90 95  
 Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu  
 100 105 110  
 Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys  
 115 120 125  
 Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro Thr  
 130 135 140  
 Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val Glu  
 145 150 155 160  
 Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser  
 165 170 175  
 Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn Lys  
 180 185 190  
 Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu Lys  
 195 200 205  
 Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala Asn  
 210 215 220  
 Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg Glu  
 225 230 235 240  
 Val Phe Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys  
 245 250 255  
 Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser Leu  
 260 265 270  
 Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
 275 280 285  
 Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
 290 295 300  
 Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val  
 305 310 315 320  
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
 325 330 335  
 Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu Ser  
 340 345 350

Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys  
 355 360 365  
 Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp Lys  
 370 375 380  
 Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln  
 385 390 395 400  
 Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro Ala  
 405 410 415  
 Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro Ala  
 420 425 430  
 Asp Gln Gln Ala Glu  
 435

<210> 33  
 <211> 433  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 33  
 Cys Thr Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu  
 1 5 10 15  
 Asn Glu Arg Thr Thr Gln Val Pro Thr Ser Ser Asn Arg Gly Lys Pro  
 20 25 30  
 Glu Arg Arg Lys Ala Ala Glu Gln Phe Asp Glu Tyr Ile Asn Lys Met  
 35 40 45  
 Ile Gln Leu Asp Lys Arg Lys His Thr Gln Asn Leu Ala Phe Asn Ile  
 50 55 60  
 Gln Leu Ser Arg Ile Lys Thr Glu Tyr Leu Asn Gly Leu Lys Glu Lys  
 65 70 75 80  
 Ser Glu Ala Glu Leu Pro Ser Lys Ile Lys Ala Glu Leu Asp Ala Ala  
 85 90 95  
 Phe Lys Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu Pro Glu Lys Lys  
 100 105 110  
 Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Val Ala  
 115 120 125  
 Glu Ala Lys Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp His Arg Asn  
 130 135 140  
 Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu Phe  
 145 150 155 160  
 Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Lys Glu Ala

	165		170		175										
Asp	Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val
	180				185				190						
Glu	Ser	Glu	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp
	195				200				205						
Arg	Glu	Lys	Ala	Glu	Glu	Glu	Glu	Ala	Lys	Arg	Arg	Ala	Asp	Ala	Lys
	210				215				220						
Glu	Gln	Asp	Glu	Ser	Lys	Arg	Arg	Lys	Ser	Arg	Gly	Lys	Arg	Gly	Ala
	225				230				235						240
Leu	Gly	Glu	Gln	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser
			245						250					255	
Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys
			260					265					270		
Pro	Gly	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Asp
	275						280					285			
Lys	Lys	Ala	Lys	Ala	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr
	290				295					300					
Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys
	305				310				315						320
Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser
			325						330					335	
Arg	Asn	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys
		340					345					350			
Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys
	355						360					365			
Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys
	370					375					380				
Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Glu
	385				390				395						400
Lys	Pro	Ala	Glu	Glu	Pro	Glu	Asn	Pro	Val	Pro	Ala	Pro	Lys	Pro	Glu
			405						410					415	
Asn	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Pro	Ala	Asp	Gln	Gln	Ala
		420						425					430		

Glu

<210> 34  
 <211> 427  
 <212> PRT

<213> Streptococcus pneumoniae

<400> 34

Val	Ala	Val	Ala	Ser	Leu	Val	Met	Gly	Ser	Val	Val	His	Ala	Thr	Glu	
1				5					10					15		
Lys	Glu	Val	Thr	Thr	Gln	Val	Pro	Thr	Tyr	Ser	Asn	Met	Ala	Lys	Thr	
			20					25					30			
Glu	His	Arg	Lys	Ala	Ala	Lys	Gln	Val	Val	Asp	Glu	Tyr	Ile	Glu	Lys	
		35					40					45				
Met	Leu	Arg	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Phe	
	50					55					60					
Ala	Phe	Asn	Met	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Glu	Tyr	Leu	Tyr	Gly	
65					70				75						80	
Leu	Lys	Glu	Lys	Ser	Glu	Ala	Glu	Leu	Pro	Ser	Glu	Val	Lys	Ala	Lys	
				85					90					95		
Leu	Asp	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Lys	Leu	Gly	
		100						105					110			
Glu	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	
		115					120					125				
Ala	Lys	Ala	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	
	130					135					140					
Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	
145				150						155					160	
Lys	Ala	Glu	Leu	Glu	Leu	Leu	Lys	Glu	Glu	Ala	Lys	Thr	Arg	Asn	Glu	
			165						170					175		
Asp	Thr	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	
		180						185					190			
Ala	Thr	Lys	Leu	Glu	Glu	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	
		195					200					205				
Glu	Ala	Lys	Arg	Lys	Ala	Glu	Ala	Glu	Glu	Asp	Lys	Val	Lys	Asp	Lys	
	210					215					220					
Leu	Lys	Arg	Arg	Thr	Lys	Arg	Ala	Val	Pro	Gly	Glu	Pro	Ala	Thr	Pro	
225					230					235					240	
Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	
				245					250					255		
Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Ala	Glu	
			260					265					270			
Ala	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	
		275					280					285				

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp  
 290 295 300  
 Leu Glu Ile Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu  
 305 310 315 320  
 Leu Val Lys Glu Glu Ala Lys Gly Ser Arg Asn Glu Glu Lys Ile Asn  
 325 330 335  
 Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu  
 340 345 350  
 Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg  
 355 360 365  
 Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro  
 370 375 380  
 Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu  
 385 390 395 400  
 Asn Pro Ala Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln Pro Lys  
 405 410 415  
 Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu  
 420 425

<210> 35  
 <211> 413  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 35  
 Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
 1 5 10 15  
 Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu  
 20 25 30  
 Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
 35 40 45  
 Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
 50 55 60  
 Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
 65 70 75 80  
 Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
 85 90 95  
 Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
 100 105 110  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp  
 130 135 140  
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 145 150 155 160  
 Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu  
 165 170 175  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
 180 185 190  
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys  
 195 200 205  
 Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala  
 210 215 220  
 Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn  
 225 230 235 240  
 Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser  
 245 250 255  
 Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val  
 260 265 270  
 Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg  
 275 280 285  
 Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu  
 290 295 300  
 Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu  
 305 310 315 320  
 Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys  
 325 330 335  
 Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr  
 340 345 350  
 Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu  
 355 360 365  
 Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala  
 370 375 380  
 Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln  
 385 390 395 400  
 Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu  
 405 410

<210> 36



<211> 425  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 36  
 Tyr Ile Ala Ser Leu Phe Leu Gly Gly Val Val His Ala Glu Gly Val  
 1 5 10 15  
 Arg Ser Glu Asn Asn Pro Thr Val Thr Ser Ser Gly Gln Asp Ile Ser  
 20 25 30  
 Lys Lys Tyr Ala Asp Glu Val Lys Ser His Leu Glu Lys Ile Leu Ser  
 35 40 45  
 Glu Ile Gln Thr Asn Leu Asp Arg Ser Lys His Ile Lys Thr Val Asn  
 50 55 60  
 Leu Ile Asn Lys Leu Gln Asp Ile Lys Arg Thr Tyr Leu Tyr Glu Leu  
 65 70 75 80  
 Asn Val Leu Glu Asp Lys Ser Lys Ala Glu Leu Pro Ser Lys Ile Lys  
 85 90 95  
 Ala Glu Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro  
 100 105 110  
 Thr Glu Pro Gly Lys Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
 115 120 125  
 Ala Glu Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp Tyr Arg Asn Tyr  
 130 135 140  
 Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
 145 150 155 160  
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Lys Glu Ala Asp  
 165 170 175  
 Glu Ser Arg Asn Glu Gly Thr Ile Asn Gln Ala Lys Ala Lys Val Glu  
 180 185 190  
 Ser Glu Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg  
 195 200 205  
 Glu Lys Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Glu Gln  
 210 215 220  
 Asp Glu Ser Lys Arg Arg Lys Ser Arg Val Lys Arg Gly Asp Phe Gly  
 225 230 235 240  
 Glu Pro Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp  
 245 250 255  
 Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys Pro Gly  
 260 265 270  
 Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys

275		280		285
Ala Lys Asp Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr Ile Thr				
290		295		300
Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys				
305		310		315
Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Gly Ser Arg Asn				
	325		330	335
Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala				
	340		345	350
Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu				
	355		360	365
Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys				
	370		375	380
Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro				
385		390		395
Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu				
	405		410	415
Lys Pro Ala Asp Gln Gln Ala Glu Glu				
	420		425	

<210> 37  
 <211> 439  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 37
Ala Ser Leu Phe Leu Gly Gly Val Val His Ala Glu Gly Val Arg Ser
1 5 10 15
Gly Asn Asn Ser Thr Val Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys
20 25 30
Tyr Ala Asp Glu Val Glu Ser His Leu Gln Ser Ile Leu Lys Asp Val
35 40 45
Asn Lys Asn Leu Lys Lys Val Gln His Thr Gln Asn Ala Asp Phe Asn
50 55 60
Lys Lys Leu Ser Lys Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Asn Val
65 70 75 80
Leu Glu Glu Lys Ser Glu Ala Glu Leu Thr Ser Lys Thr Lys Glu Thr
85 90 95
Lys Glu Glu Leu Thr Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu
100 105 110

Ser	Thr	Glu	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Lys	Lys	Lys	Val	Glu	115	120	125	
Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Lys	Asp	Arg	Arg	Asn	130	135	140	
Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	145	150	155	160
Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Val	Lys	Ala	165	170	175	
Asn	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Glu	Ala	Lys	Val	180	185	190	
Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	195	200	205	
Arg	Glu	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg	210	215	220	
Glu	Gln	Ala	Glu	Glu	Glu	Ala	Lys	Val	Lys	Asp	Glu	Pro	Lys	Lys	Arg	225	230	235	240
Thr	Lys	Arg	Gly	Val	Leu	Gly	Glu	Pro	Ala	Thr	Pro	Asp	Lys	Lys	Glu	245	250	255	
Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	260	265	270	
Ser	Pro	Ser	Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	275	280	285	
Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	290	295	300	
Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	305	310	315	320
Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	325	330	335	
Glu	Ala	Lys	Glu	Pro	Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	340	345	350	
Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	355	360	365	
Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	370	375	380	
Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	385	390	395	400
Ala	Pro	Gln	Pro	Glu	Lys	Pro	Ala	Pro	Lys	Pro	Glu	Lys	Pro	Ala	Pro	405	410	415	

Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro  
 420 425 430

Ala Asp Gln Gln Ala Glu Glu  
 435

<210> 38  
 <211> 460  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 38  
 Cys Ile Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu  
 1 5 10 15

Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn Glu  
 20 25 30

Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu Arg  
 35 40 45

Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val Gly  
 50 55 60

Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val Ala  
 65 70 75 80

Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys Ile  
 85 90 95

Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu Ser  
 100 105 110

Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser Ser  
 115 120 125

Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr  
 130 135 140

Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu Ala  
 145 150 155 160

Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu  
 165 170 175

Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu  
 180 185 190

Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu  
 195 200 205

Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys Gln  
 210 215 220

Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys  
 225 230 235 240

Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg Arg  
 245 250 255  
 Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly  
 260 265 270  
 Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys  
 275 280 285  
 Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu  
 290 295 300  
 Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
 305 310 315 320  
 Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
 325 330 335  
 Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val  
 340 345 350  
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
 355 360 365  
 Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser  
 370 375 380  
 Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys  
 385 390 395 400  
 Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val  
 405 410 415  
 Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys Ala  
 420 425 430  
 Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro  
 435 440 445  
 Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu  
 450 455 460

<210> 39  
 <211> 459  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 39  
 Ile Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu Asn  
 1 5 10 15  
 Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn Glu Ser  
 20 25 30  
 Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu Arg Asp

35					40					45					
Lys	Ala	Arg	Lys	Glu	Val	Glu	Glu	Tyr	Val	Lys	Lys	Ile	Val	Gly	Glu
50						55					60				
Ser	Tyr	Ala	Lys	Ser	Thr	Lys	Lys	Arg	His	Thr	Ile	Thr	Val	Ala	Leu
65						70					75				80
Val	Asn	Glu	Leu	Asn	Asn	Ile	Lys	Asn	Glu	Tyr	Leu	Asn	Lys	Ile	Val
				85					90					95	
Glu	Ser	Thr	Ser	Glu	Ser	Gln	Leu	Gln	Ile	Leu	Met	Met	Glu	Ser	Arg
			100					105					110		
Ser	Lys	Val	Asp	Glu	Ala	Val	Ser	Lys	Phe	Glu	Lys	Asp	Ser	Ser	Ser
		115					120					125			
Ser	Ser	Ser	Ser	Asp	Ser	Ser	Thr	Lys	Pro	Glu	Ala	Ser	Asp	Thr	Ala
		130					135					140			
Lys	Pro	Asn	Lys	Pro	Thr	Glu	Pro	Gly	Glu	Lys	Val	Ala	Glu	Ala	Lys
145						150					155				160
Lys	Lys	Val	Glu	Glu	Val	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu
			165						170					175	
Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu
			180					185					190		
Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val
		195					200					205			
Lys	Val	Lys	Ala	Asn	Glu	Pro	Arg	Asp	Lys	Gln	Lys	Ile	Lys	Gln	Ala
	210					215					220				
Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys
225						230					235			240	
Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Arg	Ala
			245					250						255	
Asp	Ala	Lys	Glu	Gln	Gly	Lys	Pro	Lys	Gly	Arg	Pro	Lys	Arg	Gly	Val
			260					265					270		
Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser
		275					280					285			
Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys
	290					295					300				
Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys
305						310					315			320	
Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr
			325					330					335		
Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu

340	345	350
Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro		
355	360	365
Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys		
370	375	380
Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys		
385	390	395
Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys		
405	410	415
Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys Thr Glu		
420	425	430
Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys		
435	440	445
Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu		
450	455	

<210> 40  
 <211> 437  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> consensus sequence

<400> 40  
 Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu Asn  
 1 5 10 15  
 Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Glu Ser  
 20 25 30  
 Gln Thr Glu His Arg Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys  
 35 40 45  
 Lys Met Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Ala Leu  
 50 55 60  
 Asn Thr Lys Leu Ser Ala Ile Lys Thr Glu Tyr Leu Asn Gly Leu Ser  
 65 70 75 80  
 Val Leu Glu Glu Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala  
 85 90 95  
 Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr  
 100 105 110  
 Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
 115 120 125

Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	130	135	140
Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	145	150	155
Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	165	170	175
Ser	Arg	Asp	Glu	Gly	Lys	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	180	185	190
Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	195	200	205
Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Arg	Ala	Asp	Ala	Lys	Leu	Gln	Glu	210	215	220
Ala	Asn	Val	Ala	Ser	Glu	Gln	Asp	Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg	225	230	235
Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	245	250	255
Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	260	265	270
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	275	280	285
Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	290	295	300
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	305	310	315
Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	325	330	335
Glu	Ser	Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Glu	Val	Glu	340	345	350
Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	355	360	365
Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	370	375	380
Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Gln	385	390	395
Pro	Glu	Lys	Pro	Ala	Glu	Glu	Pro	Glu	Asn	Pro	Ala	Pro	Ala	Pro	Pro	405	410	415
Lys	Pro	Glu	Asn	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Pro	Ala	Asp	420	425	430



Gln Gln Ala Glu Glu  
435